

REMARKS

This application has been reviewed in light of the Office Action dated June 5, 2002. Claims 1-51 are pending in this application. Claims 1-4, 7, 8, 10-16, 18, 21, 23-32, 34-43, 45, and 47-50 have been amended to define still more clearly what Applicants regard as their invention. Applicants note that the changes to all these claims affect matters of form only and do not, in any way, narrow the scope of any of these claims. Claims 1, 13, 23, 28, 34, 39, 45, and 48 are in independent form. Favorable reconsideration is requested.

The Office Action objected to the abstract relating to the proper language and form of the abstract. Applicants have amended the abstract to delete the use of the words "means" in the abstract. Applicants believe that the objection to the abstract has been remedied and therefore respectfully request its withdrawal.

Claims 23-27 and 45-47 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, asserting that "the non-operating" claim language lacked antecedent basis. Applicants have replaced "the non-operating" to --a non-operating--. In addition, Applicants have also amended 1-4, 7, 8, 10-16, 18, 21, 23-32, 34-43, 45, and 47-50 to improve the antecedent basis of certain claim elements, to improve the form of certain method claims to replace any "means" language with appropriate "step" method language, and to clarify the claim language. As noted above, Applicants submit that the changes to Claims 1-4, 7, 8, 10-16, 18, 21, 23-32, 34-43, 45, and 47-50 affect matters of form only and do not, in any way, narrow the scope of any of these claims. Applicants believe that the rejection under Section 112, second paragraph, has been obviated, and its withdrawal is therefore respectfully requested.

The Office Action rejected Claims 1-51 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,260,939 (Shioya et al.). Applicants respectfully traverse this rejection.

Applicant submits that independent Claims 1, 13, 23, 28, 34, 39, 45, and 48 4, together with the remaining claims dependent thereon, are patentably distinct from Shioya et al. at least for the following reasons.

The aspect of the present invention set forth in Claim 1 is a recording apparatus for forming a color image on a recording material. The recording apparatus includes a recording head having a plurality of recording elements, a recording head driving means for driving the recording elements of the recording head in accordance with image data to form an image on the recording material, and a plurality of supplementing means for effecting supplementations, in different manners, for supplementing defects in a recorded image resulting from a non-operating recording element of the recording elements. A control means of the apparatus selectively operates the plurality of supplementing means depending on the record image to effect the supplementation.

One important feature of Claim 1 is a control means that selectively operates the plurality of supplementing means depending on the record image to effect the supplementation.

Shioya et al. relates to a tone recording method using an ink jet recording head that records pixels using a plurality of liquid droplets. In Shioya et al., the apparatus feeds a recording material through a distance which is shorter than a length of an array of the nozzles of the recording head, and the same recording area is scanned by the recording head a plurality of times. When a defective nozzle occurs in the print apparatus used in

Shioya et al., the area that was supposed to be printed by the defective nozzle is printed by another nozzle in an additional scan. For example, as shown in Figure 15, which is described at column 12, line 64 to column 13, line 19 of the specification, when a same recording position is printed by nozzles 1, 73, 145, and 217, and only three ink droplets are ejected to the recording position, even if the nozzle 73 is defective, one of the other three nozzles will print over the affected area. Nothing, however, in the specification has been found that would teach or suggest the control means that *selectively* operates the plurality of supplementing means depending on the record image to effect the supplementation, as recited in Claim 1.

The Office Action states that Figure 17, and column 12-14 of the specification, discloses every element of the claimed invention. Figure 17 is shown on sheet 14 of 43 of the drawings and is described in the specification at column 13, lines 44-53, which states:

"FIG. 17 is a block diagram of an ink jet recording apparatus usable with the present invention. It comprises a host computer 201 for *supplying* [emphasis added] the image data to be recorded, a memory (RAM) 202 *storing* [emphasis added] the data concerning the failed nozzles, a *controller processor* [emphasis added] 203 for determining the number of ink droplets to be ejected in accordance with the image data and for selecting the nozzles to be actuated in accordance with the failed nozzle data in the RAM 202. Designated by a reference numeral 204 is an ink jet recording head."

In Shioya et al., even if Figure 17 describes a means of *supplying* the image data to be recorded, a memory *storing* the data concerning the failed nozzles, and a *controller processor* for determining the number of ink droplets to be ejected in accordance with the

image data and for selecting the nozzles to be actuated in accordance with the failed nozzle data, nothing in Shioya et al. has been found that would teach or suggest the control means that *selectively* operates the plurality of supplementing means depending on the record image to effect the supplementation, as recited in Claim 1.

Accordingly, at least for the reason described above, Applicants submit that Claim 1 is patentable over Shioya et al.

Independent Claim 13 includes a similar feature of effecting control of the forming of a color image in accordance with a selected manner as recited in Claim 1; Claims 23 and 28 are apparatus and method claims, respectively, that include a feature of effecting supplementation recording with a different color of a non-operating recording element and with similar lightnesses, for a recording position which is to be recorded by the non-operating recording element, which was not taught or suggested by Shioya et al., nor mentioned in the Office Action; Claims 34 and 39 are apparatus and method claims, respectively, that include a feature of effecting supplementation recording with a recording element for black color recording, for a recording position corresponding to a non-operating recording element among the recording elements for non-black color recording, which was not taught or suggested by Shioya et al., nor mentioned in the Office Action; and Claims 45 and 48 are apparatus and method claims, respectively, that include a feature of correcting image data corresponding to a recording element which is adjacent to a non-operating recording element of the plurality of recording elements, which was not taught or suggested by Shioya et al., nor mentioned in the Office Action. Accordingly, Claims 13, 23, 28, 34, 39, 45, and 48 are believed to be patentable over Shioya et al. at least for the reasons described above.

The other rejected claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



Attorney for Applicants

Registration No. 47,138.

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

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Appln. No. 09/845,498
Atty. Docket No. 00684.003183

VERSION WITH MARKINGS SHOWING CHANGES TO ABSTRACT

ABSTRACT OF THE DISCLOSURE

A recording apparatus for forming a color image on the recording material[,]. The recording apparatus includes a recording head having a plurality of recording elements; recording head driving [means] units for driving the recording elements of the recording head in accordance with image data to form an image on the recording material; a plurality of supplementing [means] units for effecting supplementations, in different manners, for supplementing defects in a recorded image resulting from a non-operating recording element of the recording elements; and control [means] units for selectively operating the plurality of supplementing [means] units depending on a record image to effect the supplementation.

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Appln. No. 09/845,498
Atty. Docket No. 00684.003183

VERSION WITH MARKINGS SHOWING CHANGES MADE TO CLAIMS

1. (Amended) A recording apparatus for forming a color image on [the] a recording material, comprising:
 - a recording head having a plurality of recording elements;
 - a recording head driving means for driving the recording elements of said recording head in accordance with image data to form an image on the recording material;
 - a plurality of supplementing means for effecting supplementations, in different manners, for supplementing defects in a recorded image resulting from a non-operating recording element of said recording elements; and
 - a control means for selectively operating said plurality of supplementing means depending on a record image to effect the supplementation.
2. (Amended) An apparatus according to Claim 1, wherein said supplementing means [includes] comprises a first supplementing means for effecting supplementation for a recording position which is to be recorded by the non-operating recording element with a color which is different from a color of said non-operating recording element.
3. (Amended) An apparatus according to Claim 1, wherein supplementing means [includes] comprises a second supplementing means for effecting supplementation for the defect by correcting image data corresponding to a recording element adjacent to the

non-operating recording element, on the basis of image data corresponding to the non-operating recording element.

4. (Amended) An apparatus according to Claim 1, wherein said supplementing means [includes] comprises:

a first supplementing means for effecting supplementation for a recording position which is to be recorded by the non-operating recording element with a color which is different from a color of said non-operating recording element; and

a second supplementing means for effecting supplementation for the defect by correcting image data corresponding to a recording element adjacent to the non-operating recording element, on the basis of image data corresponding to the non-operating recording element.

7. (Amended) An apparatus according to Claim 2, wherein said first supplementing means effects a recording with different colors, and effects the recording with the same colors as the non-operating recording elements but with similar lightnesses.

8. (Amended) An apparatus according to Claim 7, wherein said first supplementing means [includes] comprises a correcting means for correcting image data corresponding to the non-operating recording elements in accordance with the color corresponding [said] to the recording element effecting the supplementation, said first

supplementing means effects the supplementation on the basis of the image data corrected by said correcting means.

10. (Amended) An apparatus according to Claim 1, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

11. (Amended) An apparatus according to Claim 1, wherein said recording head [includes] comprises a plurality of nozzles, [and]
wherein the ink is ejected from [the nozzle] said plurality of nozzles by driving the recording element.

12. (Amended) An apparatus according to Claim 11, wherein said recording element [includes] comprises an electrothermal transducer for supplying thermal energy to the ink to generate a bubble in the ink.

13. (Amended) A method for forming a color image on [the] a recording material in accordance with image data, using a recording head having a plurality of recording elements, said method comprising [the steps of]:
a step of identifying a non-operating recording element of the plurality of recording elements;

a step of discriminating an image recorded by [said] the recording head;
a step of providing different supplementing manners for supplementing defects in a recorded image resulting from a non-operating recording element of [said] the plurality of recording elements, selecting a supplement manner from the different supplementing manners, and effecting control in accordance with the selected manner; and
a step of effecting recording with supplementation for the non-operating recording element through the selected manner.

14. (Amended) A method according to Claim 13, wherein said supplementing step [includes] comprises a first supplementing step of effecting supplementation for a recording position which is to be recorded by the non-operating recording element with a color which is different from a color of said non-operating recording element.

15. (Amended) A method according to Claim 13, wherein said supplementing step [includes] comprises a second supplementing step of effecting supplementation for the defect by correcting image data corresponding to a recording element adjacent to the non-operating recording element, on the basis of image data corresponding to the non-operating recording element.

16. (Amended) A method according to Claim 13, wherein said [supplementing means includes] step of providing different supplementing manners comprises:

a first supplementing step of effecting supplementation for a recording position which is to be recorded by the non-operating recording element with a color which is different from a color of said non-operating recording element; and

a second supplementing step of effecting supplementation for the defect by correcting image data corresponding to a recording element adjacent to the non-operating recording element, on the basis of image data corresponding to the non-operating recording element.

18. (Amended) A method according to Claim 17, wherein said first supplementing step [includes] comprises a correcting step of correcting image data corresponding to the non-operating recording elements in accordance with the color corresponding [said] to the recording element effecting the supplementation, said first supplementing step effects the supplementation on the basis of the image data corrected by said correcting means.

21. (Amended) A method according to Claim 13, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

23. (Amended) A recording apparatus for forming a color image on [the] a recording material with different colors, comprising:

a recording head having a plurality of recording elements;
a recording head driving means for driving the recording elements of said recording head in accordance with image data to form an image on the recording material; and
a supplementing means for effecting supplementation recording with a different color of [the] a non-operating recording element and with similar lightnesses, for a recording position which is to be recorded by the non-operating recording element.

24. (Amended) An apparatus according to Claim 23, wherein said supplementing means [includes] comprises a correcting means for correcting image data corresponding to the non-operating recording elements in accordance with the color with which the supplementation is to be effected, said supplementing means effects the supplementation on the basis of the image data corrected by said correcting means.

25. (Amended) An apparatus according to Claim 23, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

26. (Amended) An apparatus according to Claim 23, wherein said recording head [includes] comprises a plurality of nozzles, [and]
wherein the ink is ejected from [the nozzle] said plurality of nozzles by driving the recording element.

27. (Amended) An apparatus according to Claim 26, wherein said recording element [includes] comprises an electrothermal transducer for supplying thermal energy to the ink to generate a bubble in the ink.

28. (Amended) A recording method for forming a color image on [the] a recording material with different colors, using a recording head having a plurality of recording elements, comprising [the steps of]:

a step of identifying a non-operating recording element of the plurality of recording elements;

a step of effecting recording in accordance with image data; and

a step of effecting supplementation recording with a different color of the non-operating recording element and with similar lightnesses, for a recording position which is to be recorded by the non-operating recording element.

29. (Amended) A method according to Claim 28, wherein said supplementing step [includes] comprises a correcting step for correcting image data corresponding to the non-operating recording elements in accordance with the color with which the supplementation is to be effected, said supplementing step effects the supplementation on the basis of the image data corrected by said correcting step.

30. (Amended) A method according to Claim 28, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

31. (Amended) A method according to Claim 28, wherein said recording head [includes] comprises a plurality of nozzles, [and]
wherein the ink is ejected from the [nozzle] plurality of nozzles by driving the recording element.

32. (Amended) A method according to Claim 31, wherein said recording element [includes] comprises an electrothermal transducer for supplying thermal energy to the ink to generate a bubble in the ink.

34. (Amended) A recording apparatus for forming a color image on [the] a recording material with different colors, comprising:

a recording head having a plurality of recording elements;
a recording head driving means for driving the recording elements of said recording head in accordance with image data to form an image on the recording material; and
a supplementing means for effecting supplementation recording with a recording element for black color recording, for a recording position corresponding to a non-operating recording element among the recording elements for non-black color recording.

35. (Amended) An apparatus according to Claim 34, wherein said supplementing means [includes] comprises a correcting means for correcting the image data corresponding to the non-operating recording element in accordance with a color indicated by the image data, and said supplementing means effecting the recording [of] on the basis of the image data corrected by said correcting means.

36. (Amended) An apparatus according to Claim 34, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

37. (Amended) An apparatus according to Claim 34, wherein said recording head [includes] comprises a plurality of nozzles, [and]
wherein the ink is ejected from [the nozzle] said plurality of nozzles by driving the recording element.

38. (Amended) An apparatus according to Claim 37, wherein said recording element [includes] comprises an electrothermal transducer for supplying thermal energy to the ink to generate a bubble in the ink.

39. (Amended) A recording method for forming a color image on [the] a recording material with different colors, using a recording head having a plurality of recording elements, comprising [the steps of]:

a step of recording an image on the recording material by driving a plurality of recording elements of [said] the recording head in accordance with image data; and

a step of effecting supplementation recording with a recording element for black color recording, for a recording position corresponding to a non-operating recording element among the recording elements for non-black color recording.

40. (Amended) A method according to Claim 39, wherein said [supplementing] step of effecting supplementation recording [includes] comprises a correcting step for correcting the image data corresponding to the non-operating recording element in accordance with a color indicated by the image data, and said [supplementing means effecting] step of effecting supplementation recording effects the recording [of] on the basis of the image data corrected by said correcting [means] step.

41. (Amended) A method according to Claim 39, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

42. (Amended) A method according to Claim 39, wherein said recording head [includes] comprises a plurality of nozzles, [and]
wherein the ink is ejected from the [nozzle] plurality of nozzles by driving the recording element.

43. (Amended) A method according to Claim 42, wherein said recording element [includes] comprises an electrothermal transducer for supplying thermal energy to the ink to generate a bubble in the ink.

45. (Amended) A recording apparatus for forming a color image on [the] a recording material, comprising:
a recording head having a plurality of recording elements;
an inputting means for inputting multi-value image data indicative of an image density;
a correcting means for correcting image data corresponding to a recording element which is adjacent to [the] a non-operating recording element of said plurality of recording elements;
a generating means for generating driving data for driving the recording elements corresponding thereto on the basis of the image data corrected by said correcting means; and

[recording] a control means for controlling the recording elements of said recording head in accordance with the driving data thus generated to effect recording.

47. (Amended) An apparatus according to Claim 45, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.

48. (Amended) A method for forming a color image on [the] a recording material in accordance with image data, using a recording head having a plurality of recording elements, said method comprising [the steps of]:

a step of inputting multi-value image data indicative of an image density;

a step of identifying a non-recording element of the plurality of the recording elements on the basis of a variation in densities of a test pattern recorded by [said] the recording head;

a step of correcting, on the basis of the variation of the densities, image data corresponding to respective recording elements to raise an image density of the image data for the recording element which is adjacent to the non-operating recording element; [and]

a step of correcting, on the basis of the variation of the densities, image data corresponding to respective recording elements to raise an image density of the image data for the recording element which is adjacent to the non-operating recording element; [and]

a step of generating driving data for driving the recording elements corresponding thereto on the basis of the image data corrected by said correcting means; and
a step of [recording] controlling the recording elements of [said] the recording head in accordance with the driving data thus generated to effect recording.

49. (Amended) A method according to Claim 48, wherein said correcting [means] step corrects multi-value image data corresponding to the recording element located adjacent to the non-operating recording element.

50. (Amended) A method according to Claim 48, wherein the non-operating recording element [includes] comprises a recording element which has become incapable of performing a recording operation.